

What is claimed is:

1. A method for generating electricity and desalinating salinous water, the method comprising:

generating electricity with a fuel cell; and

powering a desalination system with electricity from the fuel cell to produce fresh water from the salinous water.

2. The method according to Claim 1, wherein the salinous water is selected from a group including brackish water, sea water, and combinations thereof.

3. The method according to Claim 1, wherein the desalination system is selected from the group including electrodialysis desalination systems, reverse osmosis desalination systems, multi-effect distillation desalination systems, mechanical vapor compression desalination systems, thermal vapor compression desalination systems, multi-stage flash desalination systems, humidification-dehumidification desalination systems, and combinations thereof.

4. The method of Claim 1, additionally comprising:  
producing thermal energy exhaust as a byproduct of generating electricity with the fuel cell;

heating the salinous water with the thermal energy exhaust to produce heated salinous water; and

producing fresh water from the heated salinous water.

5. The method of Claim 4, additionally comprising:  
introducing the thermal energy exhaust into a heat exchanger;  
introducing the salinous water into the heat exchanger; and  
heating the salinous water in the heat exchanger.

6. The method of Claim 5, additionally comprising producing steam from the salinous water and condensing the steam to produce the fresh water.

7. The method of Claim 6, wherein the fresh water is produced by multi-stage flash distillation.

8. The method of Claim 6, additionally comprising:  
introducing the heated salinous water into a distillation chamber;  
producing steam in the distillation chamber;  
condensing the steam in the distillation chamber to produce fresh water.

9. The method of Claim 6, wherein a salinous water feed line extends through the distillation chamber and the steam is condensed using the salinous water feed line.

10. The method of Claim 7, wherein a portion of the generated electricity powers the multi-stage flash desalination.

11. The method of Claim 5, additionally comprising introducing the heated salinous water into a reverse osmosis system.

12. The method of Claim 11, wherein a portion of the generated electricity powers the reverse osmosis system.

13. The method of Claim 12, wherein the thermal energy exhaust heats the salinous water during a first predetermined period and during a second predetermined period the thermal energy exhaust generates additional electricity.

14. The method of Claim 1 wherein the fuel cell produces electricity by electrochemical reaction.

15. The method of Claim 14, wherein the fuel cell comprises an electrolyte layer between two porous electrodes.

16. The method of Claim 15, wherein one of the two porous electrodes is an anode and the other of the two porous electrodes is a cathode.

17. The method of Claim 16, additionally comprising:  
introducing a fuel to the anode; and  
introducing an oxidant to the cathode;  
wherein electricity is formed at the anode and cathode.

18. The method of Claim 17, wherein the fuel is selected from a group including of hydrogen, hydrocarbons, and combinations thereof.

19. The method of Claim 18, wherein the fuel is selected from a group including natural gas, diesel fuel, methanol, ethanol, and combinations thereof.

20. The method of Claim 19, wherein hydrogen is produced by the hydrocarbon fuel by one of internal reforming and external reforming.

21. A hybrid system for generating electricity and desalinating salinous water, comprising:

a fuel cell, wherein the fuel cell generates electricity and thermal energy exhaust; and

a desalination system powered by the fuel cell.

22. The hybrid system of Claim 21, wherein the fuel cell is selected from a group including proton exchange membrane fuel cells, alkaline fuel cells, phosphoric acid fuel cells molten carbonate fuel cells, solid oxide fuel cells, and combinations thereof.

23. The hybrid system of Claim 21, additionally comprising:

a heat exchanger connected to the fuel cell to receive the thermal energy exhaust;

a salinous water feed line in combination with the heat exchanger, wherein the salinous water feed line is adapted to transfer unheated salinous water to the heat exchanger and to transfer heated salinous water from the heat exchanger; and

a desalination system connected to the salinous water feed line, the desalination system adapted to remove salt or brine from the heated salinous water.

24. The hybrid system of Claim 21 wherein the fuel cell produces electricity by electrochemical reaction.

25. The hybrid system of Claim 21, wherein the fuel cell comprises an electrolyte layer between two porous electrodes.

26. The hybrid system of Claim 25, wherein one of the two porous electrodes is an anode and the other of the two porous electrodes is a cathode.

27. The hybrid system of Claim 21, wherein the desalination system comprises a reverse osmosis system.

28. The hybrid system of Claim 21, wherein the desalination system comprises a flash distillation system.